Amendments to the Claims:

The following listing of claims will replace all prior versions, and listings, of claims in

the application.

1. – 21. (Canceled).

22.   (Currently amended) A <u>non-transitory</u> computer program product encoded with codes

thereon executable by a digital processing system to:

      sample a first signal ($y(t)$) at a sub-Nyquist rate and at uniform intervals;

      generate a set of sampled values ($y_s[n]$, $y(nT)$) from the first signal ($y(t)$);

      retrieve from said set of sampled values a set of shifts (t_n, t_k) and weights (c_n, c_{nr}, c_k); and

      reconstruct a second signal ($x(t)$) based on the set of shifts (t_n, t_k) and weights (c_n, c_{nr}, c_k).

23. – 24. (Canceled).

25.   (Previously Presented) An apparatus for reconstructing a first signal ($x(t)$) from a set of

sampled values ($y_s[n]$, $y(nT)$), comprising:

      a sampling device configured to generate the set of sampled values ($y_s[n]$, $y(nT)$) via

sampling a second signal ($y(t)$) at a sub-Nyquist rate and at uniform intervals; and

      a reconstruction device configured to retrieve from said set of sampled values a set of

shifts (t_n, t_k) and weights (c_n, c_{nr}, c_k) with which said first signal ($x(t)$) can be reconstructed.

26.   (Currently amended) The apparatus according to claim 25, wherein said set of ~~regularly~~

<u>uniformly</u> spaced sampled values comprises at least 2K sampled values ($y_s[n]$, $y(nT)$),

wherein the class of said first signal (x(t)) is known,

wherein the bandwidth (B, $|\omega|$) of said first signal (x(t)) is higher than $\omega_m = \pi/T$, T being

the sampling interval,

wherein the rate of innovation (ρ) of said first signal (x(t)) is finite, and

wherein said first signal is faithfully reconstructed from said set of sampled values by

solving a structured linear system depending on said known class of signal.

27.   (Previously Presented) The apparatus according to claim 25, wherein the reconstructed

signal (x(t)) is a faithful representation of the sampled signal (y(t)) or of a signal ($x_i(t)$) related to

said sampled signal (y(t)) by a known transfer function ($\varphi(t)$).

28.   (Previously Presented) The apparatus according to claim 27, wherein said transfer

function ($\varphi(t)$) includes the transfer function of a measuring device (7, 9) used for acquiring said

second signal (y(t)) and/or of a transfer channel (5) over which said second signal (y(t)) has been

transmitted.

29.   (Previously Presented) The apparatus according to claim 25, wherein the reconstructed

signal (x(t)) can be represented as a sequence of known functions ($\gamma(t)$) weighted by said weights

(c_k) and shifted by said shifts (t_k).

30.   (Previously Presented) The apparatus according to claim 25, wherein the sampling rate is

at least equal to the rate of innovation (ρ) of said first signal (x(t)).

31.   (Previously Presented) The apparatus according to claim 25, wherein a first system of

equations is solved in order to retrieve said shifts (t_k) and a second system of equations is solved

in order to retrieve said weights (c_k).

32.   (Previously Presented) The apparatus according to claim 31, wherein the Fourier

coefficients ($X[m]$) of said sample values ($y_s[n]$) are computed in order to define the values in

said first system of equations.

33.   (Previously Presented) The apparatus according to claim 25, further comprising:

        a filter configured to find at least 2K spectral values ($X[m]$) of said first signal ($x(t)$); and

        an annihilating filter configured to retrieve said arbitrary shifts (t_n, t_k) from said spectral

values ($X[m]$).

34.   (Previously Presented) The apparatus according to claim 25, wherein said first signal

($x(t)$) is a periodic signal with a finite rate of innovation (ρ).

35.   (Previously Presented) The apparatus according to claim 34, wherein said first signal

($x(t)$) is a periodical piecewise polynomial signal, the apparatus further comprising:

        a filter configured to find 2K spectral values ($X[m]$) of said first signal ($x(t)$);

        an annihilating filter configured to find a differentiated version ($x^{R+1}(t)$) of said first

signal ($x(t)$) from said spectral values; and

an integrator configured to integrate said differentiated version to find said first signal.

36.   (Currently amended) The apparatus according to claim 34, wherein said first signal (x(t))

is a finite stream of weighted Dirac pulses $\left(x(t) = \sum_{k=0}^{K-1} c_k \delta(t - t_k) \right)$, the apparatus further comprising:

        a filter configured to find the roots of an interpolating filter to find the shifts (t_n, t_k) of

said pulses, and solve a linear system to find the weights (c_n, c_k) of said pulses.

37.   (Previously Presented) The apparatus according to claim 25, wherein said first signal

(x(t)) is a finite length signal with a finite rate of innovation (ρ).

38.   (Previously Presented) The apparatus according to claim 37, wherein said reconstructed

signal (x(t)) is related to the sampled signal (y(t)) by a sinc transfer function ($\varphi(t)$).

39.   (Previously Presented) The apparatus according to claim 37, wherein said reconstructed

signal (x(t)) is related to the sampled signal (y(t)) by a Gaussian transfer function ($\varphi_\sigma(t)$).

40.   (Previously Presented) The apparatus according to claim 25, wherein said first signal

(x(t)) is an infinite length signal in which the rate of innovation (ρ, ρ_T) is locally finite, wherein

the reconstruction device is further configured to reconstruct successive intervals of said first

signal (x(t)).

41.   (Previously Presented) The apparatus according to claim 40, wherein said reconstructed

signal (x(t)) is related to the sampled signal (y(t)) by a spline transfer function ($\varphi(t)$).

42.   (Previously Presented) The apparatus according to claim 40, wherein said first signal

(x(t)) is a bilevel signal.

43.   (Previously Presented) The apparatus according to claim 40, wherein said first signal

(x(t)) is a bilevel spline signal.

44.   (Previously Presented) The apparatus according to claim 25, wherein said first signal

(x(t)) is a CDMA or a Ultra-Wide Band signal.

45.   (Previously Presented) An apparatus for reconstructing a first signal (x(t)) from a set of

sampled values (y_s[n], y(nT)), comprising:

        means for generating the set of sampled values (y_s[n], y(nT)) by sampling a second signal

(y(t)) at a sub-Nyquist rate and at uniform intervals; and

        means for retrieving from said set of sampled values a set of shifts (t_n, t_k) and weights (c_n,

c_{nr}, c_k) with which said first signal (x(t)) can be reconstructed.

46.   (Currently amended) An apparatus for sampling a first signal (x(t)), wherein said first

signal (x(t)) can be represented over a finite time interval (τ) by the superposition of a finite

number (K) of known functions (δ(t), γ(t), γ_r(t)) delayed by arbitrary shifts (t_n, t_k) and weighted

by arbitrary amplitude coefficients (c_n, c_k), ~~said method~~ <u>said apparatus</u> comprising:

        a filter configured to convolute said first signal (x(t)) with a sampling kernel ((φ(t), φ(t))

and using a regular sampling frequency (f, 1/T);

a sampling device configured to choose said sampling kernel ((φ(t), φ(t)) and said

sampling frequency (f, 1/T) such that the sampled values (y_s[n], y(nT)) completely specify said

first signal (x(t)); and

a reconstruction device configured to reconstruct said first signal (x(t)),

wherein said sampling frequency (f, 1/T) is lower than the frequency given by the

Shannon theorem, but greater than or equal to twice said finite number (K) divided by said finite

time interval (τ).

47.   (Previously Presented) The apparatus according to claim 46, wherein said first signal

(x(t)) is not bandlimited, and wherein said sampling kernel (φ(t)) is chosen so that the number of

non-zero sampled values is greater than 2K.

48.   (Currently amended) ~~A computer program~~ A non-transitory computer program product

encoded with codes thereon executable by a digital processing system to:

sample a first signal (x(t)), wherein said first signal (x(t)) can be represented over a finite

time interval (τ) by the superposition of a finite number (K) of known functions (δ(t), γ(t), γ_r(t))

delayed by arbitrary shifts (t_n, t_k) and weighted by arbitrary amplitude coefficients (c_n, c_k);

convolute said first signal (x(t)) with a sampling kernel ((φ(t), φ(t)) and using a regular

sampling frequency (f, 1/T);

choose said sampling kernel ((φ(t), φ(t)) and said sampling frequency (f, 1/T) such that

the sampled values (y_s[n], y(nT)) completely specify said first signal (x(t)); and

reconstruct said first signal (x(t)),

wherein said sampling frequency (f, 1/T) is lower than the frequency given by the

Shannon theorem, but greater than or equal to twice said finite number (K) divided by said finite

time interval (τ).

49.   (Currently amended) An apparatus for sampling a first signal (x(t)), wherein said first

signal (x(t)) can be represented over a finite time interval (τ) by the superposition of a finite

number (K) of known functions (δ(t), γ(t), γ_r(t)) delayed by arbitrary shifts (t_n, t_k) and weighted

by arbitrary amplitude coefficients (c_n, c_k), ~~said method~~ <u>said apparatus</u> comprising:

means for convoluting said first signal (x(t)) with a sampling kernel ((φ(t), φ(t)) and

using a regular sampling frequency (f, 1/T);

means for choosing said sampling kernel ((φ(t), φ(t)) and said sampling frequency (f,

1/T) such that the sampled values (y_s[n], y(nT)) completely specify said first signal (x(t)); and

means for reconstructing said first signal (x(t)),

wherein said sampling frequency (f, 1/T) is lower than the frequency given by the

Shannon theorem, but greater than or equal to twice said finite number (K) divided by said finite

time interval (τ).